THE DELAYED POLYURIC PHASE AFTER ACUTE RENAL FAILURE

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The polyuric phase after acute renal failure is normally characterized by a continuously increasing diuresis, which reaches 2000 ml per day after 4 to 5 days. In some patients however, a delayed course can be observed.

Figure 1 shows an example of such an unusual course. After 2 days of anuria (diuresis lower than 400 ml per day, isostenuria and creatinine clearance lower than 5 ml per min—according to Ballov and Jørgensen, 1963) the diuretic phase started and a daily increase was observed for three days. At the fourth day the urinary output diminished sharply to less than 300 ml per day and what you could call a second anuric phase developed. This was not preceded by a second circulatory failure. There was no water depletion caused, e.g., by peritoneal dialysis, and blood urea concentration was nearly unchanged, ranging between 260 and 280 mg/%. As Fig. 1 shows, the total serum protein decreased during this time from 8.2 to 5.3 g/%. Therefore the patient was given human serum albumin intravenously. As a result of this treatment the total serum protein went up again to 6.2 and 6.5 g/%. Together with the elevation of the total serum protein level diuresis recurred and after two days a normal daily increase could be observed.

![Diagrams showing diuresis and serum protein levels](image)

Fig. 1. A 'second anuric phase' due to hypoproteinaemia in the early recovery period of acute renal failure.
Figure 2 shows a second example of a delayed polyuric phase. After the onset of diuresis (more than 400 ml per day) practically no further increase of daily urinary output occurred. Here again the total serum protein level was low: 5.8 and 5.7 g%. Together with the elevation of total serum protein by infusions of human serum albumin diuresis increased again. In the morning of June 15th the serum protein level began to fall from 6.6 through 6.2 down to 5.9 g% in the morning of June 17th. Accompanying this fall the urinary output on June 15th showed a much smaller increase than you would expect normally and became diminished on the following day from about 1600 ml to 1000 ml per day. Only after more albumin was administered and the serum protein level became elevated from 5.9 to 6.2 g% an increase of diuresis was seen.

In our opinion these two observations show a reproducible relation between serum protein level and diuresis in the polyuric kidney. A similar relationship is well known in cirrhotics with ascites. The polyuric kidney after acute renal injury, however, is resistant to ADH—according to Grijm, Drukker and Jungerius (1965). In the polyuric kidney therefore another mechanism has to be expected which reduces the excretion of water. Figure 3 shows the renal function parameters during a "second anuric phase" due to hypoproteinaemia in the early recovery period of acute renal failure. (These data are derived from the patient of Fig. 1.) During the "second anuric phase" the creatinine clearance went down from 8 to 3.8 and 3 ml per min. The U/P ratio of osmolality was 1.11 and the tubular reabsorption of osmotically free water was 0.01 ml per min. This amounts to 14.4 ml per day. The reduction of water
excretion from 750 ml per day down to 250 respectively 265 ml per day therefore cannot be explained by antidiuresis. It is mainly due, however, to the reduction of GFR. After infusion of serum albumin, GFR and diuresis increase. The moderate increase of free water reabsorption on the following days reflects the advancing sensitivity to ADH. During this time the hypoproteinaemia was improved but not completely treated.

The relation between hypoproteinaemia and lowered diuresis in patients suffering from acute renal failure is of clinical interest. If this relation is not recognized an unnecessary long anuric phase may develop. Figure 4 shows the only one of our patients who developed a diuretic phase after 18 days of anuria. For 18 days the serum protein level was not higher than 6 g%. During this time the urine output increased very slowly only up to 320 ml per day. But after elevation of the serum protein level by albumin infusions a normal polyuric phase developed. We think it is justified to suppose that the diuretic phase could have started earlier if albumin treatment had been induced earlier. We feel that early treatment with albumin in some cases may be able to reduce the uraemic period and the time requiring dialysis treatment.
Fig. 4. The only one of our patients with acute renal failure, who developed a diuretic phase after 18 days of anuria. Together with a spontaneously increasing total serum protein only from 5.8 to 6.0 g%, diuresis showed a moderate increase too, but did not exceed 320 ml per day. After human serum albumin was given, however, a normal polyuric phase developed in parallel with the elevated serum protein level.

REFERENCES
